

**B**rucellosis is a dangerous disease in cattle that is often underestimated and has major health risk implications if it is not effectively addressed. V Pos focuses in the next few editions of Stock Farmer on tantalizing questions about brucellosis issues that is often faced by livestock farmers.

**Question: What are the dangers of brucellosis to humans and animals?**

Probably less than 15 % of the heifers born annually are vaccinated against brucellosis, although the disease is a public health risk because it is a zoonosis (infectious from animals to humans) and is harmful to international trade in cattle and their products.

"Cattle brucellosis has become a threat to the national herd and we are standing by watching. Nobody declares the status of their herds any more, and there have been death threats made at auctions when there was insistence that cattle be tested," said Dr. William Schultheiss, chairman of the Livestock Health and Production Group (LHPG) of the South African Veterinary Society.

Veterinarians should play a leadership role when it comes to brucellosis. Bio security control of brucellosis should not be done on farmers' conditions, but should be applied according to the state veterinarian policy. Each farm requires a unique set of measures to prevent spread within the herd.

There should be a mandatory goal to eradicate the disease, but it is impossible to do so because the severity of the disease in South Africa is underestimated, all herds are not annually tested and there is no control over the movement of cattle.

**Question: What are the key questions that farmers have to ask themselves?**

- What is the brucellosis status of my herd?
- How good is the bio security controls in my herd?
- How often is serological tests done and what was the latest result?
- What measures are taken after an abortion or the occurrence of a positive test to prevent it from spreading?
- What is the brucellosis status of adjacent herds?

Guidelines on how to manage a herd that has been fully vaccinated, but has become positive, should clearly be prescribed by the state veterinarian in consultation with the farmer and his private veterinarian. If a vaccinated herd becomes positive, it does not mean that the vaccine did not work. It is simply an indication that the cattle were exposed to the brucellosis bacteria. However, a farmer should regard such a herd as "positive" and he should follow the bio security plan strictly. Retesting in such a positive herd is essential.

Much more research on brucellosis is still required. The value of vaccination is such that it would limit abortions and thus the spread of bacteria.

# DO NOT UNDERESTIMATE BRUCELLOSIS

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*- Courtesy of Veeplaas*

**Question: What is the economic importance of brucellosis?**

Brucellosis has a major economic impact on the beef and dairy industry. In a survey done in 1990, 14.7 % of the herds in South Africa were infected and the losses suffered by farmers were more than R300 million per year.

**Question: Brucellosis is a state controlled disease. What does it involve?**

Internal control over animal diseases: Effective internal animal disease control systems are just as important as import and border control. If internal controls are not in place, import and border control is of no use. Internal control is only possible if all the parties, such as the National Directorate of Animal Health, provincial veterinary services, private veterinarians, organized agriculture and individual owners and managers of animals cooperate and comply with their obligations and responsibilities.

Controlled diseases and legislation: A controlled animal disease is a disease that is controlled by the state for various reasons. One reason is that the diseases pose a risk to human health. The disease is usually highly contagious and can spread quickly. Individual farmers find it difficult to manage because of the extensive physical and human resources needed for the control of such diseases. These diseases are a threat to South African agriculture, especially in terms of international trade and export.

Control of these diseases is one of the most important functions of the State Veterinary Services' Animal Health Directorate of the Department of Agriculture, Forestry and Fisheries (DAFF) and the various veterinary services of the nine provinces. The Animal Diseases Act (Act 35 of 1984) grants the necessary powers and authority to Veterinary Services to perform this task successfully. A sound knowledge of the Act is required for all officers of the state involved in animal disease control.

**The Act consists of the following:**

- The Animal Diseases Act (Act 35 of 1984) as amended.
- The Animal Disease Regulations and the amendments thereto.
- The Cattle Tuberculosis Scheme.
- The Cattle Brucellosis Scheme.

Each official in veterinary service must have this legislation and if any changes are made, it is his / her duty to it to his / her copy accordingly.

**Question: How many types of *Brucella abortus bovis* strains are in South Africa?**

Eight biovars of *Brucella abortus bovis* occurs. A total of 90 % of all field cases in South Africa can be attributed to biovar one and about 10 % to biovar two. To say that strains S19 and RB-51 does not occur in South Africa and by implication to speculate that the vaccines are useless, is scientifically irresponsible and speaks of dangerous ignorance. If new strains are discovered, these findings should be presented to the scientific community for evaluation.

**Question: Of what importance is it that *B. abortus bovis* is an intracellular organism?**

Since brucellosis, tuberculosis and *Staphylococcus aureus*, are all intracellular pathogens, antibiotic treatment against them is disappointing. This is simply because MC (minimum bactericidal concentration) of the antibiotic required to kill the bacterium (not just to stop dividing = bacteriostatic) cannot be achieved intracellular.

Antibiotics work well against susceptible bacteria outside cells. It is why it is so difficult to treat Malta fever in people. Tetracycline should be administered for a long time and many long courses may be necessary to stop all extracellular bacteria from dividing. Incidentally, tetracycline is bacteriostatic and unfortunately, with regard to brucellosis, not bactericidal. Thus, in vitro (Kirby Bauer sensitivity in the laboratory) the brucellosis bacterium is very vulnerable, but in vivo, where the germ is "hiding" in the cell, treatment results are disappointing to say the least.

Furthermore, prolonged treatment, as required by humans, cannot be applied to cattle. Cattle are ruminants and rely on their rumen microbes to degrade cellulose into volatile fatty acids, which then ultimately become a source of energy in the liver. Without a functional rumen, the cattle will be dead. There are just too many unacceptable "collateral damage" with prolonged antibiotic treatment in cattle. The risk of residues in meat and milk is another reason (food safety).

**Question: What are the main ways in which cattle are infected with brucellosis germs?**

Direct contact with the bacterium is necessary to cause infection. Cattle smell aborted placentas, caused by brucellosis, and so become infected. An infected cow also turns around and the placenta fluid ends up in the water trough. An important route of transmission is through the mucous membranes of the eyelids. The role of flies, which sit on infected material and then land many miles away on the eyes of cattle in a "closed" herd, is underestimated and is not uncommon. If vaccination by ocular administration of live vaccines is possible, it is also true for the transmission of disease causing field strains by flies - in this case brucellosis.

As little as a millionth ( $10^6$ ) of a millilitre infected vaginal discharge could convey brucellosis - given that as little as 1 000 ( $10^3$ ) brucellosis bacteria are needed for infection and infected vaginal secretions contain more than a billion ( $10^9$ ) bacteria per millilitre.

**Question: How long can the brucellosis germs survive in nature?**

In an aborted foetus in the shade the germs can survive for up to eight months. Germs in wet soil can survive for two to three months and for one to two months in dry soil. In manure the germ can survive for three to four months and for eight months in liquid manure tanks. In general it can be assumed that if animals are removed from an infected camp for a month and the facilities are properly disinfected with 2.5 % formalin, infection should not take place in these camps and facilities.



“Antibiotics work well against susceptible bacteria outside cells.”

**Question: Is the brucellosis germ excreted in the milk?**

In cows lactating after abortion the brucellosis germ is excreted in the colostrum and milk, and it is an important source of infection. Germs can also be excreted various times during the lactation period.

**Question: Can calves be infected if they consume milk infected with brucellosis?**

If the calves were born from mothers who never were vaccinated it is possible that the calves can contract brucellosis by ingesting infected colostrum and milk.

**Question: What is the role of urine and manure in the transmission of brucellosis?**

Urine and faeces of infected animals is a less important source of infection for other animals.

**Question: I had pregnancy tests done some time ago (maybe a reason for the heifer that aborted?).**

So I do not know which cows are not pregnant. Should I have all non-pregnant cows inoculated? (I did remove the bull from the cows on the day of the examination, so there should not be more pregnant cows. I do accept that the veterinarian could have missed one or two that he could not pick up because they may be very early pregnant.)

Is it worth it to invest money in a cow (s) that failed you because she is not pregnant? Why is she not pregnant? Is it not better that she contributes to the cash flow of your business by transforming her into cash?

Note: pregnancy tests done on the day that the bull is removed, will not determine those cows that are less than six weeks pregnant (which were fertilized within the previous six weeks), because the foetus is too small.

**Question: Can brucellosis be transmitted by AI?**

Not by the act itself, but rather through infected semen. Bulls can carry brucellosis and play a role in the spread thereof. AI bulls must be free of brucellosis.

**Question: Can brucellosis be transmitted by embryo transplants?**

The risk of bringing brucellosis into a herd by means of embryo transplants is probably of no importance.

**Question: What is the brucellosis status of calves born in a brucellosis-infected herd?**

All calves being born in a brucellosis-infected herd must be regarded as a potential source of infection. The disease may suddenly break through after two years in the seemingly clean tested herd since these calves that were latently infected only test positive from the middle of their first pregnancy or even later during pregnancy.

**Question: What is the role of bulls in the spread of brucellosis?**

Bulls can also become infected and especially the testes are affected. The infection can occur in one or both testicles. The infection can occur in varying degrees and as the perimeter of the testes is measured, it can range from almost no increase to very enlarged. The ejaculatory ducts and glands that produce seminal fluid can also be affected. The bull can become infertile. Swelling of the joints (higroon) may also be observed. It is especially the front "knee/s" that swell. These conditions may also be observed when bulls are vaccinated with strain 19 brucellosis vaccine.

There is no evidence that bulls are more resistant to brucellosis. Bulls can already become infected in the womb or pick up the infection through the mouth when they are very young.

They stay infected as they get older. Bulls should be examined by a veterinarian and tested because they can excrete brucellosis germs in their semen and infect females. In herds where brucellosis occurs bulls must always be regarded with great suspicion.

It is therefore very important that bulls, whose semen are to be used for artificial insemination, must be thoroughly tested for diseases that can be transmitted by semen.

Brucellosis serological testing is thus absolutely necessary as part of the breeding soundness examination each bull has to undergo before being sold or change of ownership. Bulls should also be tested during the annual cow tests.

**Question: If my bulls do have brucellosis, should I slaughter them?**

Definitely.

**Question: Is there wildlife species that have tested positive for brucellosis?**

Yes, buffalo, hippo, zebra, eland and impala.

**Question: What does a positive serological test for brucellosis mean in an animal?**

All that a positive serological test in inoculated or properly vaccinated animals means is that such an animal has been exposed to a field strain. It is uncertain whether properly vaccinated cattle is protected against permanent carrier status of brucellosis and whether such an animal with subsequent calving's will infect the environment with fewer bacteria. Unfortunately the state does not differentiate between serologically positive vaccinated and serologically positive inoculated herds. The latter have to be slaughtered because they are probably permanent carriers.

**Question: If a cow is infected with the *Brucella* germ, does she remain a carrier of brucellosis?**

A total of 90 % of infected cows will remain chronically infected. The infection can be present for life and the contamination is limited to the udder and lymph nodes.

**Question: How can it be proved that a serologically positive animal is a permanent carrier?**

The only proof that a serologically positive animal is a permanent carrier is to grow the field strains from reproductive system liquid (lochia) or lymph nodes or mammary gland tissue of the uterus in a reliable laboratory.

**Question: Is there such thing as a closed herd?**

There is no such thing. If flies can sit on the aborted foetus and placenta of the neighbour's cattle, they can sit down on your cattle's mucous membranes after flying through the 24 - wire electrical fence of 10,000 volts and then infect the cattle very effectively with the bacterium and the serological test will be positive, despite vaccination.

**Question: What is the role of latent carriers in brucellosis?**

The role of latent carriers should not be underestimated. These cattle test serologically negative despite the fact that they are carriers. They are descendants of carriers and grew up in a mixture of *Brucella* bacteria in the womb - such that their immune systems see *Brucella* as "own" and do not manufacture diagnostic antibodies against it.

**Question: How do I test cattle for brucellosis?**

Contact your veterinarian to help you take the necessary samples.

The milk ring test (MRT) is a very sensitive screening test which is a very good indication of brucellosis in a herd. The MRT can give false positive reactions when there are high cell counts in milk.

You should test the whole herd each year for contagious abortion (CA). The blood test will determine the carriers (that will mostly calf normally). Heifers born from CA-positive mothers are positive for CA but test negative. All descendants (including bulls) of CA-positive mothers spread CA even if they all test negative. Blood samples should be sent to an accredited laboratory.

**Question: How many tests should I have done before I can say my herd is clean?**

If the test is negative and the herd today is truly free of brucella bacteria, tomorrow the herd can be, without us knowing about it, be positive. With latent carriers that test a false negative and the test that is not 100 % sensitive, this question is difficult to answer. Three negative tests in a row at one month intervals between each test could be accepted as a norm that a herd is serologically negative.

**Question: Is there any other way, except for samples taken by a veterinarian to determine whether there is CA in the herd?**

There is no shortcut. If you wait until the swollen knees and abortion or retained placentas occur, it is too late. Yes, the organism can be isolated from this material by sending samples to a laboratory, but it is much better to identify and slaughter carriers that do not show clinical signs.

**Question: What factors can affect the test results?**

- If a heifer is vaccinated slightly late, she is going to test slightly suspicious for a few years, usually until after her first calving. That is why it is important to vaccinate heifers with Brucella S19 (Onderstepoort vaccine) only between four to eight months, preferably closer to four months in early sexually maturing breeds.
- It is important to indicate which animals are heifers, so that if reactions occur among younger animals, they are not erroneously indicated as positive.
- Furthermore, the heavily-pregnant cow can test suspicious or even positive.
- It should always be determined whether there really is a wild strain of *Brucella abortus* (contagious brucellosis germ) in the herd using culture (from colostrum or, even better, the calf or placenta). If it is confirmed that the herd is infected with the wild strain, one should not take a chance and try to distinguish between the wild strain and the vaccine strain, since 20% or more heifers from infected mothers first test positive (latent carriers) after the first or subsequent calvings.
- Incorrect results from the laboratories.
- The biggest mistakes occur during the blood collection process. During the blood collection process, the farmer must be present and personally write the numbers of the animals on the CA5 form against the bottle number that the person collecting the blood is using.

**Question: What should be done if positive test results are received?**

- It is important that if a farmer doubts the results or is unhappy with it, he should discuss it with the state veterinarian.
- It is also important that farmers rather focus on scientific facts and not lend their ears to every farmer who has a complaint or theory.
- Do not overreact to the fact that the cows tested positive and rather laughter them indiscriminately. If they calf and do not abort, keep them apart and away from the bull and test them at least three times in twelve months before you start slaughtering them.
- If heifers tested positive, keep them aside for at least twelve months before you test them again.
- I know of people who sold supposedly positive heifers to be slaughtered and then saw them with calves later in another person's kraal. When he told the person that the cows have brucellosis, the other person told him that they had been tested for two years and that they tested clean.
- Actual positive cows secrete thousands of brucellosis-organisms and when they calf they infect grazing, where the organisms can survive for months in cool and damp conditions.

**Question: I recently bought a farm with 55 Charolais cows from my neighbour. When I tested them for CA two months later, it was found that 27 of the cows were CA positive. Does it make sense to vaccinate the calves of the CA cattle with S19 or R51? Can you explain the current compensation for CA slaughtering?**

There is currently no compensation from state side for CA, although that was the case in the past. Positive CA cattle must be marked with a C - branding to identify them and to make sure that they are not be sold (except for slaughter), in order to stop the further spread of the disease.

A cow infected with CA will usually abort only once (just 40 % abort), but every time she calves, she secretes millions of GM organisms (*Brucella abortus*) and further infects the environment and other cows. Up to 20 % or more calves from infected mothers will test positive.

**Question: What is the role of vaccines against brucellosis?**

Vaccines reduce the risk of abortion due to brucellosis.

**Question: Will immunization with strain 19 and / or RB-51 vaccine prevents cattle infected with a wild strain of *Brucella abortus bovis* from building antibodies against it?**

No vaccine (S19 or RB-51) shall prevent the humeral immune system of a cow to produce antibodies after the cattle vaccinated with the pathogenic field strain of Brucella bacterium has been exposed to it.

**Question: What do the terms "S19" and "RB-51" mean?**

The concepts of "S19" and "RB-51" do not refer to field strains of *B. abortus bovis* in South Africa. It is vaccine strains that help to protect against abortion, caused by field strains of *B. abortus bovis*.

**Question: What will happen if S19 is administered twice between the ages of four and eight months?**

If the S19 vaccine is administered twice between the ages of four and eight months, the law is contravened and the serological response will be present after the age of 18 months.

**Question: What immunization can be followed to prevent abortions and to limit the secretion of germs?**

Inoculate replacement heifer from the age of four to five months (after the bulls have been removed from the cows) with *Brucella* strain 19 (G0101) or RB-51 (G3056) vaccine, which will result in 65-75% of vaccinated females developing immunity to CA.

To increase the percentage of cows in the herd developing an immunity to CA repeat the RB-51 vaccine about two to three weeks after weaning, at about eight to nine months of age (never during or shortly after weaning). Repeat it once more, but not less than one month before the expected first breeding.

If females are vaccinated three times against CA, the herd should be very close to developing 99% plus protection against CA. Bulls play a major role in the transmission of brucellosis. The brucellosis germs live in the epididymis and are secreted with the semen. Heifers born from CA positive mothers can be positive for CA but can test negative. Cows come on heat and positive cows secrete germs with the vulva discharge. It is very important to know that bulls should never be vaccinated with *Brucella* vaccines because the vaccine can cause inflammation of the testicles and surrounding tissue, leading to infertility.

**Question: Is the RB-51 vaccine only used in South Africa?**

The RB-51 vaccine was developed in the USA. Since 1996 it is the official vaccine for use in the U. S. The vaccine is also used in certain countries in South America, as well as in Spain and Portugal in the European Union. The vaccine was registered in 2002 in South Africa.

**Question: Is it possible to determine with the tests whether a positive test is due to vaccination or infection with *B. abortus bovis* germ?**

This is not possible with only one test, and in an infected herd it will be more difficult. It is important not to test heifers before the age of 18 months if they were vaccinated with S19. The only way to be 100% sure of the status of the animal is to take a culture of the germ in the colostrum or uterus fluids after calving, or alternatively from the placenta or lymph nodes at slaughter.

**Question: What is the reason for the explosion of brucellosis in South Africa?**

Vaccination is just a part of the control and eradication strategy against cattle brucellosis. There are clear guidelines from the state on the requirements to transport cattle, but farmers trade and move cattle at random. Most heifers that are born each year in South Africa are never vaccinated.

If we look at the number of heifers reaching the age of four months each year and compare it with S19 & RB-51 vaccine sales, we find with a shock that only about 20% are vaccinated. If we want to control the disease, 80% plus of all heifers need to be vaccinated.

**Question: What problem does brucellosis have for humans?**

Worldwide, more than 500,000 cases of brucellosis per year are reported. Because it is a disease that can be transmitted to humans (zoonoses), the medical industry must pay more attention. This is a public health risk and all the people who might have been exposed to it and show cold symptoms, should be tested for brucellosis.



“If females are vaccinated three times against CA, the herd should be very close to developing 99% plus protection against CA.”

Bovine brucellosis is highly contagious for people who become infected through contact with infected, aborted fetuses, uterus fluids after birth and the consumption of unpasteurised milk. This is known as undulant fever, easily confused with diseases such as flu and often not properly diagnosed because the symptoms are often non-specific. Some of the symptoms are a wavy (variable) fever, back and leg pain, sore throat, joint and muscle pain, persistent cough, headache, heavy sweating, weight loss, fatigue and depression. Brain inflammation and heart illnesses can also occur, as well as orchitis in males and abortions in pregnant women. People with chronic brucellosis experience lower back pain, hepatitis, heart valve inflammation and meningitis.

**Question: How can brucellosis be controlled and prevented?**

- Be very careful where you buy cattle.
- The disease can also spread at auctions where dairy cows and other cattle breeds are kept in the same pen.
- Test the pregnant heifers as well as the rest of the herd as soon as possible for brucellosis. Vaccination of pregnant animals leads to resorptions, abortions and premature calves.

- Insist to see the laboratory results in writing. Recently, a farmer even doctored laboratory results and a fake copy was given to the buyer.
- Beware of heifers if they come from a positive herd. The incubation period of the disease (infection to respond positively to the blood test) is from eight days to two years or even longer.
- If you do not vaccinate and the disease enters the herd, it will spread rapidly. The S19 and RB-51 vaccine will, with only one vaccination, give only 70 % coverage against contracting the disease.
- Recommendation: Vaccinate heifers with S19 at four to five months. Vaccinate heifers at eight to nine months with RB-51 (not during weaning, as the stress of weaning will influence the immune reaction negatively). Vaccinate the heifers again two months before they are mated with RB-51 vaccine.
- Note: The vaccine helps to prevent abortions - and by implication the spreading of the organism. A properly vaccinated animal will always be positive when challenged with the field strain. The vaccine does not paralyze the animal's immune system to react against the field strain.
- Pregnant animals should not automatically be vaccinated with RB-51 because it is not without risk. Where an abortion storm occurs, it may be considered to vaccinate the animals in order to limit abortions. Vaccination of pregnant animals leads to resorptions, abortions and premature calves.
- Keep an accurate vaccination register of all animals and ensure that the vaccines are applied correctly.
- Remember that heifers of infected mothers can be infected in the womb.
- Separate the positive and negative cattle from each other - at least round about their calving, when they calve and 40 days after calving and during milking in dairy herds when the positive cows must be milked last before disinfecting the milking machine.
- Use separate equipment for positive and negative cattle.
- Make a separate camp where the cows can calve. Avoid calf camps with grass because it promotes the concentration of contamination. Let positive cows calf separately on cement with bedding.
- Build a separate crush with a cement floor where calving is done and disinfect the floor with 2.5 % formalin, after it has been used.
- Destroy contaminated material and burn it immediately before dogs, cats, foxes or other scavengers that eat placenta or aborted foetuses, can excrete and spread the *Brucella* bacteria through their droppings.
- The cow must remain in seclusion until she is clean and has no more secretions.

- If the farm is a dairy enterprise, it is best to build special calving pens with a cement floor covered with clean, new bedding for the cow when she comes in before calving.
- Test every second month until there are three consecutive negative tests. Consult with the state and local veterinarian.
- All cows that calf now, should be vaccinated with RB-51 vaccine (not later than 30 days after birth) before putting them with the bull. It must be sustained for at least a year.
- Test all bulls.
- Control flies, which also can transmit infection from the afterbirth of carrier cows/heifers to other animals.
- Clean feed and water troughs regularly if contamination occurs from calving fluids.
- Crows and foxes should be controlled as they can spread germs from placentas.
- Colostrum from infected cows should not be given to calves from clean cows.
- Pasteurise milk for human consumption to prevent human infection.

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